Testimony of
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Committee on Science
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Madam Chairman and Members of the Subcommittee, thank you for the opportunity to testify today about the Department of Energy's (DOE) Office of Science (SC) Fiscal Year 2005 budget request. The Department appreciates the support of the Chairman and the Members of the Committee over the past years and I look forward to working with you to ensure that our Nation stays at the leading edge of science and technology.

The Office of Science FY 2005 budget request is $3.4 billion, a $68.5 million decrease from the FY 2004 appropriation levels. When $140.8 million for FY 2004 Congressionally-directed projects is set aside, there is an increase of $72.3 million in FY 2005. This request makes investments in: Advanced Scientific Computing Research (ASCR), Basic Energy Sciences (BES), Biological and Environmental Research (BER), Fusion Energy Sciences (FES), High Energy Physics (HEP), Nuclear Physics (NP), Science Laboratories Infrastructure, Safeguards and Security, Workforce Development for Teachers and Scientists and Science Program Direction.

Using the definitions in OMB Circular A-11, 76 percent of the Office of Science FY 2005 budget request is for basic research, and zero percent is for applied research, development, demonstration and deployment activities. Of the remainder, 16 percent is for Capital Equipment and Construction; and 8 percent is for Science Laboratories Infrastructure, Science Program Direction, Workforce Development for Teachers and Scientists, and Safeguards and Security.

This budget allows us to increase support for high priority scientific research, increase operations at our key scientific user facilities, keep major science construction projects on schedule, and support new initiatives. This request, coming at a time of tight overall Federal budgets, is also a demonstration of the Administration's support for basic research and the role that fundamental science plays in keeping our Nation strong and secure.

Office of Science
FY 2005 President's Request
(B/A in thousands)

	FY 2003 Comparable Approp.	FY 2004 Comparable Approp.	FY 2005 President's Request
Science			
Advanced Scientific Computing Research	163,185	202,292	204,340
Basic Energy Sciences	1,001,941	1,010,591	1,063,530
Biological & Environmental Research	494,360	641,454	501,590
Congressionally-directed projects	*(51,927)*	*(140,762)*	*(——)*
Core Biological and Environmental Research	*(442,433)*	*(500,692)*	*(501,590)*
Fusion Energy Sciences	240,695	262,555	264,110

	FY 2003 Comparable Approp.	FY 2004 Comparable Approp.	FY 2005 President's Request
High Energy Physics	702,038	733,631	737,380
Nuclear Physics	370,655	389,623	401,040
Science Laboratories Infrastructure	45,109	54,280	29,090
Science Program Direction	137,425	152,581	155,268
Workforce Development for Teachers & Scientists	5,392	6,432	7,660
Small Business Innovation Research/Technology Transfer	100,172	——	——
Safeguards and Security	61,272	56,730	67,710
Subtotal, Science	3,322,244	3,510,169	3,431,718
Use of prior year balances	——	-10,000	——
Total, Science	**3,322,244**	**3,500,169**	**3,431,718**
Total, excluding Congressionally-directed projects	*(3,270,317)*	*(3,359,407)*	*(3,431,718)*

I am proud to tell you that the Department of Energy was ranked the most improved cabinet-level agency in the most recent scorecard to assess implementation of the President's Management Agenda (PMA). The scorecard, which evaluates agency performance in the areas of human capital, competitive sourcing, financial management, e-government, and budget/performance integration, was issued by the Office of Management and Budget (OMB) in January and recognized the Department as one of the agencies "leading the pack with regard to management improvement."

Budget and performance integration is implemented using the Program Assessment and Rating Tool (PART). PART includes a thorough review of program purpose, planning, management, and performance activities. Although the Office of Science uses recognized processes such as competition and peer review, the PART process raised the question as to how we validate that these systems are working for our programs. As a result, all six Science programs are instituting a Committee of Visitors (COV) process that will bring in outside experts to evaluate the effectiveness of our competitive, peer review process in selecting excellent research programs. Basic Energy Sciences piloted the COV approach and is pleased with the specific actionable recommendations that resulted.

To meet the goals of the PMA, Science has undertaken a reengineering effort that will flatten the organization and clarify roles and responsibilities. Science is also working toward improved electronic management systems and has begun to receive grant applications electronically - an important improvement for the research administrators in universities and not-for-profit institutions.

The Department has made a strong commitment to a results-driven, performance-based approach to management of itself and its government-owned, contractor-operated laboratories. Laboratory contracts are being renegotiated so that mutually agreed upon performance measures will result in increased contractor authority and accountability, while lessening the burden of DOE day-to-day oversight of activities. In January of this year, the Department announced that it will compete the management and operating contracts for seven of the DOE laboratories.

In September 2003, the Department issued its updated Strategic Plan and incorporated this Plan and the Performance Plan into the FY 2005 budget request. The performance measures included in this budget were developed with input from our scientific advisory committees and OMB. A website (www.sc.doe.gov/measures) has been developed to more fully explain the new measures within the context of each program.

SCIENCE PLANS AND PRIORITIES

The Office of Science plays four key roles in the U.S. research effort. *We provide solutions to our Nation's energy challenges*, contributing essential scientific foundations to the energy, national, and economic security missions of the DOE. *We are the Nation's leading supporter of the physical sciences*, investing in research at over 280 universities, 15 national laboratories, and many international research institutions. *We deliver the premier tools of science to our Nation's science enterprise*, building and operating major research facilities for open access by the science community. *We help keep the U.S. at the forefront of intellectual leadership*, supporting the core capabilities, theories, experiments, and simulations to advance science.

This FY 2005 budget request will set us on the path toward addressing the challenges that face our Nation in the 21st Century. SC has recently released *Facilities for the Future of Science: A Twenty-Year Outlook* which sets an ambitious agenda for scientific discovery over the next two decades. The priorities established in this plan—which is clearly not a budget document—reflect national priorities set by the President and the Congress, our commitment to the DOE missions, and the views of the U.S. scientific community. Pursuing these priorities will be challenging, but they hold enormous promise for the overall well-being of all of our citizens. The FY 2005 request provides funding for the top 5 facility priorities in the plan as follows: ITER $7,000,000; Ultrascale Scientific Computing Capability $38,212,000; Joint Dark Energy mission $7,580,000; Linac Coherent Light Source $54,075,000; and Protein Production and Tags $5,000,000. There are multiple factors that will influence the realization of this plan, including available budgetary resources and other National priorities; nevertheless, it is our intention to proceed according to the plan's delineated priorities as circumstances allow.

We have recently released an updated *Office of Science Strategic Plan* that is fully integrated with the Facilities Plan, the Department's Strategic Plan, and the President's Management Agenda – including the R&D Investment Criteria and OMB's Program Assessment Rating Tool. The FY 2005 budget request begins to implement these plans.

I am increasingly mindful that the health and vitality of U.S. science and technology depends upon the availability of the most advanced research facilities. DOE leads the world in the conception, design, construction, and operation of these large-scale devices. These machines have enabled U.S. researchers to make some of the most important scientific discoveries of the past 70 years, with spin-off technological advances leading to entirely new industries. More than 19,000 researchers and their students from universities, other government agencies (including the National Science Foundation and the National Institutes of Health), private industry, and those from abroad use DOE facilities each year. These users are growing in both number and diversity.

Because of the extraordinarily wide range of scientific disciplines required to support facility users at national laboratories, and the diversity of mission-driven research supported by the Office of Science, we have developed an interdisciplinary capability that is extremely valuable to some of the most important scientific initiatives of the 21st Century. There is also a symbiotic relationship between research and research tools. Research efforts advance the capabilities of the facilities and tools that in turn enable new avenues of research.

Excluding funds used to construct or operate our facilities, approximately half of our research funding goes to support research at universities and institutes. Academic scientists and their students are funded through peer-reviewed grants, and SC's funding of university research has made it an important source of support for graduate students and postdoctoral researchers in the physical sciences during their early careers.

Mindful of the role that the Office of Science plays in supporting the physical sciences and other key fields, I would now like to briefly outline some specific investments that we are proposing in the FY 2005 Request.

SCIENCE PROGRAMS

ADVANCED SCIENTIFIC COMPUTING RESEARCH

FY 2004 Comparable Appropriation - $202.3M; FY 2005 Request - $204.3M

The Advanced Scientific Computing Research (ASCR) program significantly advances scientific simulation and computation. It applies new approaches, algorithms, and software and hardware combinations to address the critical science challenges of the future, and provides Nation's scientific community with access to world-class, scientific computation and networking facilities. ASCR supports advancements in practically every field of science and industry. The ASCR budget also supports the *Scientific Discovery through Advanced Computing (SciDAC)* program — a set of coordinated investments across all Office of Science mission areas with the goal of achieving breakthrough scientific advances via computer simulation that were previously impossible using theoretical or laboratory studies alone.

The FY 2005 budget request includes $204.3 million for ASCR to advance U.S. leadership in

high performance supercomputing and networks for science and to continue to advance the transformation of scientific simulation and computation into the third pillar of scientific discovery. The request includes $38.2 million for the *Next Generation Computer Architecture (NGA)* research activity, which is part of a coordinated interagency effort that supports research, development and evaluation of new architectures for scientific computers that could help enable continued U.S. leadership in science. Enhancements are supported for ASCR facilities – the Energy Sciences Network (ESnet) and the National Energy Research Scientific Computing Center (NERSC). The request also includes $8.5 million for the new *Atomic to Macroscopic Mathematics* research effort to provide the research support in applied mathematics needed to break through the current barriers in our understanding of complex physical processes.

BASIC ENERGY SCIENCES

FY 2004 Comparable Appropriation - $1,010.6M; FY 2005 Request - $1,063.5M

The Basic Energy Sciences (BES) program is a principal sponsor of fundamental research for the Nation in the areas of materials sciences and engineering, chemistry, geosciences, and bioscience as it relates to energy. This research underpins the DOE missions in energy, environment, and national security; advances energy-related basic science on a broad front; and provides unique user facilities for the scientific community and industry.

For FY 2005, the Department requests $1.1 billion for BES including $208.6 million to continue to advance nanoscale science through atomic- and molecular-level studies in materials sciences and engineering, chemistry, geosciences, and energy biosciences. This supports Project Engineering Design (PED) and construction of four Nanoscale Science Research Centers (NSRCs) and a Major Item of Equipment for the fifth and final NSRC. NSRCs are user facilities for the synthesis, processing, fabrication, and analysis of materials at the nanoscale. The request also includes $80.5 million for construction and $33.1 million for other project costs for the Spallation Neutron Source, and $54.1 million for research, development, PED, and long lead procurement of the Linac Coherent Light Source, a revolutionary x-ray free-electron laser light source. With these tools, we will be able to understand how the compositions of materials affect their properties, watch proteins fold, see chemical reactions, and design matter for desired outcomes.

The FY 2005 budget request also includes $29.2 million for activities that support the President's Hydrogen Fuel Initiative. This research program is based on the BES workshop report, *Basic Research Needs for the Hydrogen Economy,* which highlights the enormous gap between our present capabilities and those required for a competitive hydrogen economy.

BIOLOGICAL AND ENVIRONMENTAL RESEARCH

FY 2004 Comparable Appropriation - $641.5M; FY 2005 Request - $501.6M

The Biological and Environmental Research (BER) program advances energy-related biological

and environmental research that has broad impacts on our health, our environment, and our energy future. The program includes components in genomics and our understanding of complete biological systems, such as microbes that produce hydrogen; in climate change, including the development of models to predict climate over decades to centuries; developing science-based methods for cleaning up environmental contaminants; in radiation biology, providing regulators with a stronger scientific basis for developing future radiation protection standards; and in the medical sciences, by developing new diagnostic and therapeutic tools, technology for disease diagnosis and treatment, non-invasive medical imaging, and biomedical engineering such as an artificial retina that will restore sight to the blind. For FY 2005, the Department requests $501.6 million for BER. The FY 2004 appropriation includes $140.8 million of one-time Congressionally-directed projects, for which no additional funds are being requested in FY 2005.

Research on microbes through the *Genomics: GTL* program, addressing DOE energy and environmental needs, continues to expand from $63.5 million in FY 2004 to $67.5 million in FY 2005. The request also provides $5 million for initiation of PED activities for the GTL Facility for the Production and Characterization of Proteins and Molecular Tags, a facility that will help move the *Genomics: GTL* systems biology research program to a new level by greatly increasing the rate and cost-effectiveness with which experiments can be done. DOE, through the *Genomics: GTL* program, will attempt to use genetic techniques to harness microbes to consume pollution, create hydrogen, and absorb carbon dioxide.

FUSION ENERGY SCIENCES

FY 2004 Comparable Appropriation - $262.6M; FY 2005 Request - $264.1M

The Fusion Energy Sciences (FES) program advances the theoretical and experimental understanding of plasma and fusion science, including a close collaboration with international partners in identifying and exploring plasma and fusion physics issues through specialized facilities. This includes: 1) exploring basic issues in plasma science; 2) developing the scientific basis and computational tools to predict the behavior of magnetically confined plasmas; 3) using the advances in tokomak research to enable the initiation of the burning plasma physics phase of the Fusion Energy Sciences program; 4) exploring innovative confinement options that offer the potential of more attractive fusion energy sources in the long term; 5) focusing on the scientific issues of nonneutral plasma physics and High Energy Density Physics; 6) developing the cutting edge technologies that enable fusion facilities to achieve their scientific goals; and 7) advancing the science base for innovative materials to establish the economic feasibility and environmental quality of fusion energy.

When the President announced that the U.S. would join in the International Thermonuclear Experimental Reactor (ITER) project he noted that "the results of ITER will advance the effort to produce clean, safe, renewable, and commercially available fusion energy by the middle of this century." To this end, the Department continues its commitment to the future of Fusion Energy Science research with a request of $264.1 million, slightly above the FY 2004 enacted level. Within that amount, $38 million is requested for preparations for ITER in FY 2005, $30

million more than in FY 2004. Of this $38 million, $7 million is for scientists and engineers who will support the International Team and for the qualification of vendors that will supply superconducting cable for ITER magnets. The remaining $31 million will be used to support refocused experiments in our tokamak facilities and for component R&D in our laboratories and universities that is closely related to our ongoing program but which is focused on ITER's specific needs. The researchers and facilities that we support will not be doing less work because of ITER, but some of their time and effort will be directed to different, ITER-related, work than they were doing before.

Multilateral negotiations are ongoing with respect to the specific ITER site, with two sites competing to host the facility. We are conducting technical assessments of both sites, and we fully expect to conclude this negotiation in a timely manner. ITER construction funds are not required until FY 2006 which gives time for contingency planning, if necessary.

Fabrication continues on the National Compact Stellarator Experiment (NCSX), an innovative confinement system that is the product of advances in physics understanding and computer modeling. In addition, work will be initiated on the *Fusion Simulation Project* that, upon completion, will provide an integrated simulation and modeling capability for magnetic fusion energy confinement systems over a 15-year development period. The Inertial Fusion Energy research program will be redirected toward high energy density physics research based on recommendations that will come from the recently established Interagency Task Force on High Energy Density Physics.

HIGH ENERGY PHYSICS

FY 2004 Comparable Appropriation - $733.6M; FY 2005 Request - $737.4M

The High Energy Physics (HEP) program advances our understanding of the basic constituents of matter, including the mysterious dark energy and dark matter that make up most of the universe; the striking imbalance of matter and antimatter in the universe; and the possible existence of other dimensions. Collectively, these investigations will reveal the key secrets of the birth, evolution, and final destiny of the universe. HEP expands the energy frontier with particle accelerators to study fundamental interactions at the highest possible energies, which may reveal previously unknown particles, forces or undiscovered dimensions of space and time; explain how everything came to have mass; and illuminate the pathway to the underlying simplicity of the universe.

For FY 2005, the Department requests $737.4 million for the HEP program, an increase from FY 2004. The highest priority in HEP is the operation, upgrade and infrastructure for the two major HEP user facilities at the Fermi National Accelerator Laboratory (Fermilab) and the Stanford Linear Accelerator Center (SLAC), to maximize the scientific data generated.

In 2005, the Neutrinos at the Main Injector (NuMI) facility will be complete and the beam line will be commissioned. The FY 2005 budget request also supports research and design activities for a new Major Item of Equipment, the BTeV ("B Physics at the TeVatron") experiment at

Fermilab that will extend current investigations, using modern detector technology to harvest a data sample more than 100 times larger than current experiments. Research and development work continues in FY 2005 on the proposed Supernova Acceleration Probe (SNAP) experiment for the DOE/NASA Joint Dark Energy Mission (JDEM).

NUCLEAR PHYSICS

FY 2004 Comparable Appropriation - $389.6M; FY 2005 Request - $401M

The Nuclear Physics (NP) program supports innovative, peer reviewed scientific research to advance knowledge and provide insights into the nature of energy and matter, and in particular, to investigate the fundamental forces which hold the nucleus together, and determine the detailed structure and behavior of the atomic nuclei. Nuclear science plays a vital role in studies of astrophysical phenomena and conditions of the early universe. At stake is a fundamental grasp of how the universe has evolved, an understanding of the origin of the elements, and the mechanisms of supernovae core collapse. The program builds and supports world-leading scientific facilities and state-of-the-art instruments necessary to carry out its basic research agenda. Scientific discoveries at the frontiers of Nuclear Physics further the nation's energy-related research capacity, which in turn provides for the nation's security, economic growth and opportunities, and improved quality of life.

The FY 2005 budget request of $401 million gives highest priority to exploiting the unique discovery potentials of the facilities at the Relativistic Heavy ion Collider (RHIC) and Continuous Electron Beam Accelerator Facility (CEBAF) by increasing operating time by 26% compared with FY 2004. R&D funding is provided for the proposed Rare Isotope Accelerator (RIA) and 12 GeV upgrade of CEBAF, which is located at Thomas Jefferson National Accelerator Facility.

Operations of the MIT/Bates facility will be terminated as planned, following three months of operations in FY 2005 to complete its research program. This facility closure follows the transitioning of operations of the Lawrence Berkeley National Laboratory 88-Inch Cyclotron in FY 2004 from a user facility to a dedicated facility for the testing of electronic circuit components for use in space (using funds from other agencies) and a small in-house research program. These resources have been redirected to better utilize and increase science productivity of the remaining user facilities and provide for new opportunities in the low-energy subprogram.

SCIENCE LABORATORIES INFRASTRUCTURE

FY 2004 Comparable Appropriation - $54.3M; FY 2005 Request - $29.1M

The Science Laboratories Infrastructure (SLI) program supports SC mission activities at SC laboratories by addressing needs related to general purpose infrastructure, excess facilities disposition, Oak Ridge landlord, health and safety improvements and payment in lieu of taxes

(PILT).

The FY 2005 budget request supports three ongoing line item construction projects at Lawrence Berkeley National Laboratory, Brookhaven National Laboratory and the Stanford Linear Accelerator Center and nine projects to clean-up/remove 84,000 square feet of excess space to reduce operating costs, and environment, safety and health liabilities, and to free up land for future use. The request also supports activities to maintain continuity of operations at the Oak Ridge Reservation (ORR), including Federal facilities in the town of Oak Ridge and PILT for local communities surrounding Oak Ridge. PILT is also provided to communities surrounding Brookhaven and Argonne East.

We have continued to work cooperatively with the Occupational Safety and Health Administration (OSHA) and the Nuclear Regulatory Commission (NRC) teams as they have conducted audits of our laboratories. NRC has completed its audits; OSHA is expected to complete its audits in mid-March 2004. The laboratories are preparing cost estimates to meet the requirements as identified by those agencies, and we plan to provide this information to Congress by May 31, 2004.

SAFEGUARDS AND SECURITY

FY 2004 Comparable Appropriation - $56.7M; FY 2005 Request - $67.7M

Safeguards and Security activities reflects the Office of Science's commitment to maintain adequate protection of cutting edge scientific resources and assets. The FY 2005 budget request includes $9.8 million for Pacific Northwest Site Office safeguards and security activities, which were transferred from the Office of Environmental Management. In FY 2005, Safeguards and Security will enable the Office of Science laboratories to meet the requirements of Security Condition 3 level mandates for the protection of assets. The request also provides the laboratories with the ability to maintain requirements of increased Security Condition 2 level for 60 days. The funding includes the increase needed to meet expectations of the revised Design Basis Threat approved by the Secretary in May 2003. In addition, critical cyber security investments will be made to respond to the ever changing cyber threat.

WORKFORCE DEVELOPMENT FOR TEACHERS AND SCIENTISTS

FY 2004 Comparable Appropriation - $6.4M; FY 2005 Request - $7.7M

The mission of the Workforce Development for Teachers and Scientists program is to continue the Office of Science's long-standing role of training young scientists, engineers, and technicians in the scientifically and technically advanced environments of our National Laboratories.

The FY 2005 budget request of $7.7 million provides $1.5 million for a *Laboratory Science Teacher Professional Development* activity. About 90 participating teachers will gain

experience and enhance their skills at five or more DOE laboratories in response to the national need for science teachers who have strong content knowledge in the classes they teach. A new $500,000 *Faculty Sabbatical Fellowship* activity will provide sabbatical opportunities for 12 faculty members from minority serving institutions (MSIs). This proposed activity is an extension of the successful *Faculty and Student Teams* (FaST) program where teams of faculty members and two or three undergraduate students, from colleges and universities with limited prior research capabilities, work with mentor scientists at a National Laboratory to complete a research project that is formally documented in a paper or presentation.

SCIENCE PROGRAM DIRECTION

FY 2004 Comparable Appropriation - $152.6M; FY 2005 Request - $155.3M

The mission of Science Program Direction is to provide a Federal workforce, skilled and highly motivated, to manage and support basic energy and science-related research disciplines, diversely supported through research programs, projects, and facilities under the Office of Science's leadership.

Science Program Direction consists of two subprograms: Program Direction and Field Operations. The Program Direction subprogram is the single funding source for the SC Federal staff in Headquarters responsible for directing, administering, and supporting the broad spectrum of scientific disciplines. This subprogram also includes program planning and analysis activities which provide the capabilities needed to evaluate and communicate the scientific excellence, relevance, and performance of SC basic research programs.

The Field Operations subprogram is the centralized funding source for the SC Federal workforce in the field who are responsible for providing business, administrative, and specialized technical support to SC and other DOE programs. Our service centers in Chicago and Oak Ridge provide primary support to SC laboratories and facilities, including Ames, Argonne National Laboratory, Brookhaven National Laboratory, Lawrence Berkeley National Laboratories, Oak Ridge National Laboratory, Pacific Northwest National Laboratory, Fermilab, Princeton Plasma Physics Laboratory, Thomas Jefferson National Accelerator Facility, and Stanford Linear Accelerator Center.

Secretary Abraham approved the Office of Science Restructuring (OneSC) on January 5, 2004. OneSC was initiated in July 2002 to embrace the changes envisioned by the President's Management Agenda (PMA) to accomplish government programs more economically and effectively by creating a new, more efficient, and productive SC organization. It will also provide a management environment in which the success and high performance of SC employees can continue in the face of changing resources, requirements, and societal needs.

The FY 2005 budget request of $155.3 million represents a 1.8% increase over the FY 2004 enacted level. This increase is reflected in salaries and benefits to support a total SC workforce of 1,014 full-time equivalents (FTEs). Compared to FY 2004, the FY 2005 request is flat or lower in our other major budget categories, such as travel, training, support services, and other related expenses. We will

continue to leverage resources and rely on building good business practices by streamlining operations, improving financial controls, and reengineering business processes in support of the PMA and the OneSC structure.

CONCLUSION

The Office of Science occupies a unique and critical role within the U.S. scientific enterprise. We fund research projects in key areas of science that our Nation depends upon. We construct and operate major scientific user facilities that scientists from virtually every discipline are using on a daily basis, and we manage civilian national laboratories that are home to some of the best scientific minds in the world.

Our researchers are working on many of the most daunting scientific challenges of the 21st Century. These include pushing the frontiers of the physical sciences through nanotechnology and exploring the key questions at the intersection of physics and astronomy. We are also pursuing opportunities at the intersection of the physical sciences, the life sciences, and scientific computation to understand how the instructions embedded in genomes control the development of organisms, with the goal of harnessing the capabilities of microbes and microbial communities to help us to produce energy, clean up waste, and sequester carbon from the atmosphere. The Office of Science is also pushing the state-of-the-art in scientific computation, accelerator R&D, plasma confinement options and a wide array of other technologies that advance research capabilities and strengthen our ability to respond to the rapidly changing challenges ahead.

I want to thank you, Madam Chairman, for providing this opportunity to discuss the Office of Science's research programs and our contributions to the Nation's scientific enterprise. This concludes my testimony. I would be pleased to answer any questions you might have.